Covid-19 project

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1. One paragraph that summarizes the statistical significance of the predictors for covid-19 incidence rate and mortality rate. Note the predictors in the models are standardized.

In a significance level of 95%. Significant predictors for covid-19 incidence rate (standardized): Page1, Page2, Page15, Pmale, Phispanic, precipitation, Ppoverty017_2018, Pnohighschool1418, Phighschool1418, Psomecollege1418, Pcollege1418.

With one degree of increase in stateWashington, the cases decrease for 0.87523.With one degree of increase in stdz(Page1), the cases increase for 1.213919. With one degree of increase in stdz(Page2), the cases increase for 1.253928. With one degree of increase in stdz(Page15) the cases increase for 2.887256. With one degree of increase in stdz(Pmale) the cases decrease for 0.312624 . With one degree of increase in stdz(Phispanic) the cases increase for 1.054298. With one degree of increase in stdz(precipitation) the cases increase for 0.359754 .With one degree of increase in stdz(Ppoverty017_2018) the cases decrease for 0.940153 . With one degree of increase in stdz(Pnohighschool1418) the cases increase for 32.063124. With one degree of increase in stdz(Phighschool1418) the cases increase for 31.415069. With one degree of increase in stdz(Psomecollege1418) the cases increase for 25.687180. With one degree of increase in stdz(Pcollege1418) the cases increase for 61.529335.

Thus, the cases number do have relationship with the location, age, gender, race, weather, poverty and education level.

In a significance level of 95%. Significant predictors for covid-19 mortality rate (standardized): Page2, Page4, Page10, Page15, Pwhite, Pblack, PpovertyALL_2018, Ppoverty017_2018. We can conclude that there is a statistically significant association between the response variable and the term.

With one degree of increase in stdz(Page2) the death decreases for 13.6849. With one degree of increase in stdz(Page4) the death decreases for 12.9210.With one degree of increase in stdz(Page7) the death decreases for 13.5852.With one degree of increase in stdz(Page10) the death decreases for 6.5212.With one degree of increase in stdz(Page15) the death decreases for 18.0300.With one degree of increase in stdz(Pwhite) the death increases for 7.0487.With one degree of increase in stdz(Pblack) the death increases for 2.2524. With one degree of increase in stdz(Pasian) the death increases for 5.3487. With one degree of increase in stdz(PpovertyALL_2018) the death increases for 8.4688.With one degree of increase in stdz(Ppoverty017_2018) the death decreases for 7.8237.

Thus, the death number do have relationship with the age, race, weather and poverty condition.

R output:

```
> summary(case.model)
Generalized linear mixed model fit by maximum likelihood (Adaptive Gauss-Hermite
  Quadrature, nAGQ = 0) [glmerMod]
 Family: poisson  ( log )
Formula: cases ~ state + stdz(Page1) + stdz(Page2) + stdz(Page3) + stdz(Page4) +
    stdz(Page5) + stdz(Page6) + stdz(Page7) + stdz(Page8) + stdz(Page9) +
    stdz(Page10) + stdz(Page11) + stdz(Page12) + stdz(Page13) +
    stdz(Page14) + stdz(Page15) + stdz(Page16) + stdz(Page17) +
    stdz(Pmale) + stdz(Pwhite) + stdz(Pblack) + stdz(Pasian) +
    stdz(Phispanic) + stdz(MaxTemp) + stdz(MinTemp) + stdz(precipitation) +
    stdz(PpovertyALL_2018) + stdz(Ppoverty017_2018) + stdz(Unemployment_rate_2018) +
    stdz(Med_HH_Income_2018) + stdz(Med_HH_Income_vs_Total_2018) +
    stdz(Pnohighschool1418) + stdz(Phighschool1418) + stdz(Psomecollege1418) +
    stdz(Pcollege1418) + (1 + stdz(date) | county)
   Data: combineddata
 Offset: TOT_POP/1e+06

     AIC      BIC   logLik deviance df.resid
 13669.7  13862.1  -6795.8  13591.7      988

Scaled residuals:
     Min       1Q   Median       3Q      Max
-16.3058  -0.9526  -0.0783   0.5200  17.3641

Random effects:
 Groups Name          Variance Std.Dev. Corr
 county (Intercept) 0.2268   0.4762
        stdz(date)  1.4140   1.1891   -0.34
Number of obs: 1027, groups:  county, 63
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Fixed effects:
                                      Estimate Std. Error z value Pr(>|z|)
(Intercept)                           2.938244   0.707526   4.153 3.28e-05 ***
stateWashington                      -0.875233   1.165153  -0.751 0.452548
stdz(Page1)                           1.213919   0.544512   2.229 0.025789 *
stdz(Page2)                          -1.253928   0.624769  -2.007 0.044747 *
stdz(Page3)                           1.035567   0.654249   1.583 0.113459
stdz(Page4)                          -0.414820   0.669988  -0.619 0.535820
stdz(Page5)                          -0.039398   1.319991  -0.030 0.976189
stdz(Page6)                           1.272102   0.650865   1.954 0.050645 .
stdz(Page7)                          -0.303388   0.608164  -0.499 0.617879
stdz(Page8)                           0.015770   0.555530   0.028 0.977353
stdz(Page9)                           0.006145   0.494916   0.012 0.990094
stdz(Page10)                          0.268227   0.377379   0.711 0.477231
stdz(Page11)                          0.237417   0.312244   0.760 0.447040
stdz(Page12)                          0.306791   0.547948   0.560 0.575554
stdz(Page13)                         -0.345909   0.900361  -0.384 0.700838
stdz(Page14)                         -1.658867   0.932265  -1.779 0.075175 .
stdz(Page15)                          2.887256   0.814890   3.543 0.000395 ***
stdz(Page16)                          0.515638   1.031631   0.500 0.617196
stdz(Page17)                         -0.826170   0.617513  -1.338 0.180929
stdz(Pmale)                          -0.312624   0.096620  -3.236 0.001214 **
stdz(Pwhite)                         -0.314787   0.340553  -0.924 0.355309
stdz(Pblack)                         -0.174026   0.213530  -0.815 0.415074
stdz(Pasian)                          0.281853   0.351154   0.803 0.422179
stdz(Phispanic)                       1.054298   0.372703   2.829 0.004673 **
stdz(MaxTemp)                         0.187124   0.233525   0.801 0.422958
stdz(MinTemp)                        -0.285074   0.243128  -1.173 0.240984
stdz(precipitation)                   0.359754   0.145428   2.474 0.013370 *
stdz(PpovertyALL_2018)                0.620758   0.366746   1.693 0.090530 .
stdz(Ppoverty017_2018)               -0.940153   0.351938  -2.671 0.007554 **
stdz(Unemployment_rate_2018)          0.066603   0.222825   0.299 0.765014
stdz(Med_HH_Income_2018)              1.063694   1.353226   0.786 0.431842
stdz(Med_HH_Income_vs_Total_2018)    -1.417486   1.355348  -1.046 0.295632
stdz(Pnohighschool1418)              32.063124   9.586003   3.345 0.000823 ***
stdz(Phighschool1418)                31.415069   8.949764   3.510 0.000448 ***
stdz(Psomecollege1418)               25.687180   7.491790   3.429 0.000606 ***
stdz(Pcollege1418)                   61.529335  17.679000   3.480 0.000501 ***
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Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
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```
> summary(death.model)
Generalized linear mixed model fit by maximum likelihood (Adaptive Gauss-Hermite
  Quadrature, nAGQ = 0) [glmerMod]
 Family: poisson  ( log )
Formula: deaths ~ state + stdz(Page1) + stdz(Page2) + stdz(Page3) + stdz(Page4) +
    stdz(Page5) + stdz(Page6) + stdz(Page7) + stdz(Page8) + stdz(Page9) +
    stdz(Page10) + stdz(Page11) + stdz(Page12) + stdz(Page13) +
    stdz(Page14) + stdz(Page15) + stdz(Page16) + stdz(Page17) +
    stdz(Pmale) + stdz(Pwhite) + stdz(Pblack) + stdz(Pasian) +
    stdz(Phispanic) + stdz(MaxTemp) + stdz(MinTemp) + stdz(precipitation) +
    stdz(PpovertyALL_2018) + stdz(Ppoverty017_2018) + stdz(Unemployment_rate_2018) +
    stdz(Med_HH_Income_2018) + stdz(Med_HH_Income_vs_Total_2018) +
    stdz(Pnohighschool1418) + stdz(Phighschool1418) + stdz(Psomecollege1418) +
    stdz(Pcollege1418) + (1 + stdz(date) | county)
   Data: combineddata
 Offset: (cases + 0.5)/1e+06


     AIC      BIC   logLik deviance df.resid
  1690.6   1883.0   -806.3   1612.6      988

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.2693 -0.2259 -0.0807 -0.0013  3.1885

Random effects:
 Groups Name          Variance Std.Dev. Corr
 county (Intercept)   2.941    1.715
        stdz(date)    3.015    1.736    1.00
Number of obs: 1027, groups:  county, 63
```

Fixed effects:

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.3288	5.2198	-0.063	0.949771	
stateWashington	-6.7749	9.0343	-0.750	0.453312	
stdz(Page1)	2.2120	4.0176	0.551	0.581928	
stdz(Page2)	-13.6849	5.7249	-2.390	0.016830	*
stdz(Page3)	5.1820	4.4786	1.157	0.247241	
stdz(Page4)	-12.9210	6.2109	-2.080	0.037492	*
stdz(Page5)	-12.9796	8.5131	-1.525	0.127344	
stdz(Page6)	3.3242	4.4601	0.745	0.456078	
stdz(Page7)	-13.5852	4.8166	-2.820	0.004795	**
stdz(Page8)	-3.1763	4.4603	-0.712	0.476389	
stdz(Page9)	2.0073	2.6424	0.760	0.447460	
stdz(Page10)	-6.5212	2.3660	-2.756	0.005848	**
stdz(Page11)	0.6165	2.2603	0.273	0.785049	
stdz(Page12)	-6.4858	3.7862	-1.713	0.086707	.
stdz(Page13)	0.8553	5.9769	0.143	0.886216	
stdz(Page14)	-4.2663	7.2513	-0.588	0.556299	
stdz(Page15)	-18.0300	8.8929	-2.027	0.042615	*
stdz(Page16)	-0.4897	6.0696	-0.081	0.935693	
stdz(Page17)	-3.4231	3.4972	-0.979	0.327679	
stdz(Pmale)	-0.9885	0.7711	-1.282	0.199854	
stdz(Pwhite)	7.0487	1.9643	3.588	0.000333	***
stdz(Pblack)	2.2524	0.8823	2.553	0.010687	*
stdz(Pasian)	5.3487	1.3180	4.058	4.94e-05	***
stdz(Phispanic)	-0.2036	2.1218	-0.096	0.923567	
stdz(MaxTemp)	-0.8277	1.3191	-0.627	0.530379	
stdz(MinTemp)	2.1715	1.5006	1.447	0.147889	
stdz(precipitation)	-0.3321	0.8082	-0.411	0.681102	
stdz(PpovertyALL_2018)	8.4688	2.3619	3.586	0.000336	***
stdz(Ppoverty017_2018)	-7.8237	2.7556	-2.839	0.004523	**
stdz(Unemployment_rate_2018)	2.0221	1.9759	1.023	0.306131	
stdz(Med_HH_Income_2018)	9.9385	8.6926	1.143	0.252902	
stdz(Med_HH_Income_vs_Total_2018)	-8.4818	9.1966	-0.922	0.356383	
stdz(Pnohighschool1418)	85.4382	56.4437	1.514	0.130105	
stdz(Phighschool1418)	82.7803	52.4726	1.578	0.114660	
stdz(Psomecollege1418)	66.4370	44.0928	1.507	0.131874	
stdz(Pcollege1418)	161.5569	104.4490	1.547	0.121923	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1